

PRESENTATION PROJECT--Response to a "request for proposal" (RFP)

Overview:

Engineers are often required to design a product to specification, then to present the design to a client for adaptation or approval; i.e., sometimes engineers are salesmen. This project requires each team to carry out this research/design/presentation activity.

Assignment:

A design competition to be delivered to this class as a twelve minute oral presentation. The object is to come up with a practical design for the assigned project and convince the audience that your solution is better than those offered by other groups. Considerations of cost, practicality, and implementation are crucial. Sketches or drawings are encouraged. Since this classroom is computer-equipped, PowerPoint presentations could be an option. You are selling your product. Present what you think is necessary to do just that. Your group will be given one of the following problems:

- a) It is extremely important for patients on prescribed medication to take that medication at the proper times and over the recommended period. If they don't, not only can the patients' conditions deteriorate, but also new, drug-resistant strains of "bugs" can develop. Unfortunately, many people—for example, the elderly—forget to take their medication; others stop taking it when they begin to feel better; still others are rebellious and choose not to take it at all. Design some method or device that would improve the drug-taking compliance rate of these patients. Some systems already exist. For example, a box with little compartments can be filled with pills, where each compartment is labeled with a time and date. Unfortunately the patient has to remember to look in the box to be reminded whether he or she has taken the pills for that particular time/date. What is needed is a system that relies less on the memory and awareness of the patient.
- b) A sculptor has been commissioned by a city government to create a piece of kinetic sculpture. He wants to produce a piece that carries out its movement only very rarely. In fact, he wants his sculpture to perform at random times on average only once a year. He believes that the rarity of motion will increase interest; people who happen to pass as it performs will feel especially rewarded. The problem is, he needs a device that will close a switch at random times with an average time between closings of one per year. Each point in time should be equally likely to produce the event. Electricity is available. But he does not want any apparatus that involves a computer. Design a practical mechanism that can meet his needs. If necessary, your device may be manually reset after each event.
- c) A new class of drugs is being developed whose proper dosage is extremely sensitive to body weight and total skin area. Too small a dose is ineffective; too large a dose is toxic. Measuring a patient's body weight is, of course no problem. But how do you determine total skin area? Your task is to design a method for determining total skin area within 0.1% of its true value. This method, which may or may not involve instrumentation and supplies, is to be carried out in a physician's office. Cost of instrumentation and supplies, time to carry out the procedure, and propriety of the procedure are all important.

d) France has an extensive system of high-speed (120km/hr) toll roads called “autoroutes”. These autoroutes are very effective in getting travelers around France. Unfortunately, they’re somewhat dangerous because motorists often ignore the speed limits, which change depending on whether the roads are wet or dry. Speed traps are only partially effective, because radar detectors and straight roads let drivers know exactly where to slow down. Once passed, the drivers return to their excessive speed. Design a system or protocol that will address this problem. Your design should include some practical way of detecting and identifying speeders and/or ensuring that maximum speed limits are not exceeded. Of course, cost and effectiveness are both important.

e) Transmission of electric power through remote parts of this country is an important part of our nation's energy supply. However, monitoring these long, remote power lines for wire to ground faults can be problematic. Electric power is transmitted over long distances using high voltages and power lines located approximately 100 feet above ground. The wires are suspended from metal towers using ceramic insulators. These insulators prevent the transmitted current from running down the metal towers into the ground. However, animals or tree branches occasionally cause shorts across these insulators, generating ground faults that disrupt the power transmission. To repair the ground fault, a work crew must be sent into the field to replace the shorted insulator. However, the crew must first find the faulted tower before it can be repaired. Since these faults often occur in remote areas, determining which tower has the fault is not a simple task.

Your goal is to design an inexpensive device that will signal which tower along a 100 mile long line has the ground fault. This could be a visual signal or a remotely transmitted signal. But, given there are over 1000 towers in those 100 miles, cost should be kept low. The device should be designed to operate for 5 years without replacing parts and will experience temperatures ranging from -20°C to 40°C and all types of precipitation. You may assume that during a fault, at least 400 amps of current are shunted down a single, four legged tower for approximately 1 second. The towers are made of common carbon steel and are painted to reduce corrosion.

f) Design a “butter shooter” which could produce pats of butter (or margarine) from a ¼ pound stick. Pat thickness should be adjustable. Consider ease of use, “kitchen appeal”, ease of cleanup, and uniformity of pats. And since butter can have different consistencies depending on its temperature, design a device that can accommodate a reasonable range of hardness.